



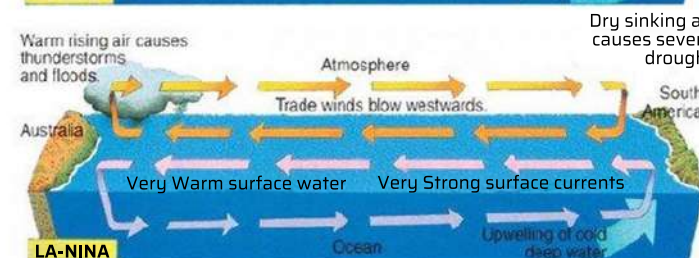
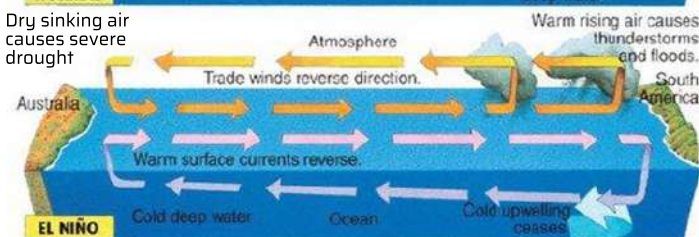
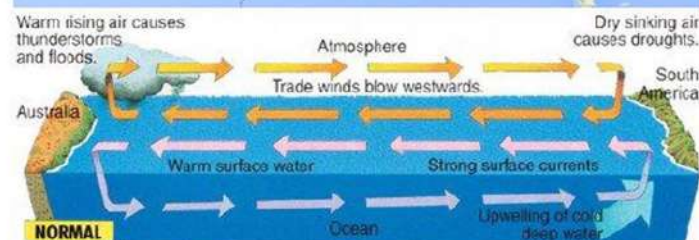
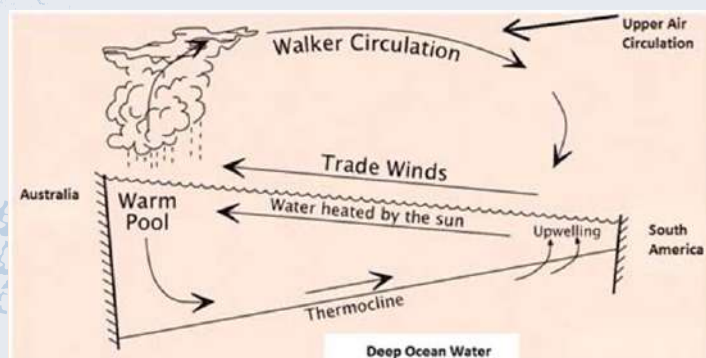
QUICK REVISION MODULE **(UPSC PRELIMS 2022) GEOGRAPHY** **MISCELLANEOUS**

EL- NINO & LA-NINA

These can be defined as climate pattern that describes the unusual warming and cooling of surface waters in the eastern tropical Pacific Ocean.



	Pressure conditions	Ocean currents	Atmospheric circulation
Normal	<ul style="list-style-type: none"> Low Pressure Australian coast High Pressure Peruvian coast 	<ul style="list-style-type: none"> Westward warm surface current 	<ul style="list-style-type: none"> Trade winds westward
El-Nino	<ul style="list-style-type: none"> High Pressure Australian coast Low Pressure Peruvian coast 	<ul style="list-style-type: none"> Eastward warm surface current 	<ul style="list-style-type: none"> Trade winds Eastwards
La-Nino	<ul style="list-style-type: none"> Low Pressure Australian coast High Pressure Peruvian coast 	<ul style="list-style-type: none"> Westward very warm surface current 	<ul style="list-style-type: none"> Trade winds westward



The Southern Hemisphere has a horizontal air circulation cell called as Walker Cell responsible for upwelling along the South American Coast and bringing rains in Australia.

Why does EL Nino and La Nina occur ?

- Exact reason for why does they occur is still not understood.
- They results from interaction between the surface layers of the ocean and the overlying atmosphere in tropical Pacific.
- It is the internal dynamics of the coupled ocean-atmosphere system that determine the onset and termination of El Nino events.
- It is also believed that Pacific oceans' shape & geometry also influence El-Nino events.
- The system oscillates between warm (El Nino) to neutral (or cold) conditions with a natural periodicity of roughly 3-4 years.
- External forcing from volcanic eruptions (submarine or terrestrial) have no connection with El Nino. Nor do sunspots as far as we know.



Impact of El-Nino and La-Nina

AREA	El-Nino	La-Nina
For INDIA	<ul style="list-style-type: none"> ○ El Nino and Indian monsoon are inversely related. ○ El Nino directly impacts India's agrarian economy as it tends to lower the production of summer crops such as rice, sugarcane, cotton and oilseeds. 	<ul style="list-style-type: none"> ○ Abnormally heavy monsoons in India and Southeast Asia
For the rest of the WORLD	<ul style="list-style-type: none"> ○ Drought and dry conditions in eastern Australia resulting in forest fires etc. ○ Good precipitation in Southern USA. 	<ul style="list-style-type: none"> ○ Cool and wet winter weather in southeastern Africa, wet weather in eastern Australia, ○ Cold winter in western Canada and north western United States, ○ Winter drought in the southern United States.

ENSO

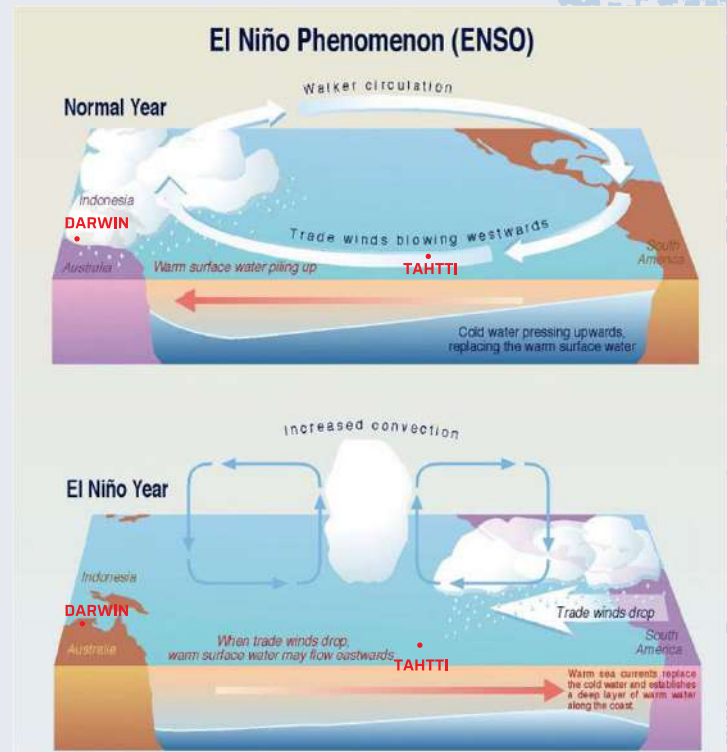
- The formation of an **El Nino [Circulation of Water]** is linked with Pacific Ocean circulation pattern known as the **southern oscillation** [circulation of atmospheric pressure].
- Southern Oscillation, in oceanography and climatology, is a coherent inter-annual **fluctuation of atmospheric pressure** over the tropical Indo-Pacific region.
- El Nino and Southern Oscillation coincide most of the times hence their combination is called **ENSO - El Nino Southern Oscillation**.

Condition	Temperature & Pressure conditions
Only El-Nino	<ul style="list-style-type: none"> ○ Warm water in eastern pacific. ○ Cold water in western pacific.
Only SO	<ul style="list-style-type: none"> ○ Low pressure over eastern pacific. ○ High pressure over western pacific.
ENSO	<ul style="list-style-type: none"> ○ Warm water & low pressure over eastern pacific. ○ Cold water & high pressure over western pacific.

Normally, lower pressure over Darwin and higher pressure over Tahiti encourages a circulation of air from east to west, drawing warm surface water westward and bringing precipitation to Australia and the western Pacific. When the pressure difference weakens, which is strongly coincidental with El Nino conditions, parts of the western Pacific, such as Australia experience severe drought, while across the ocean, heavy precipitation can bring flooding to the west coast of equatorial South America.

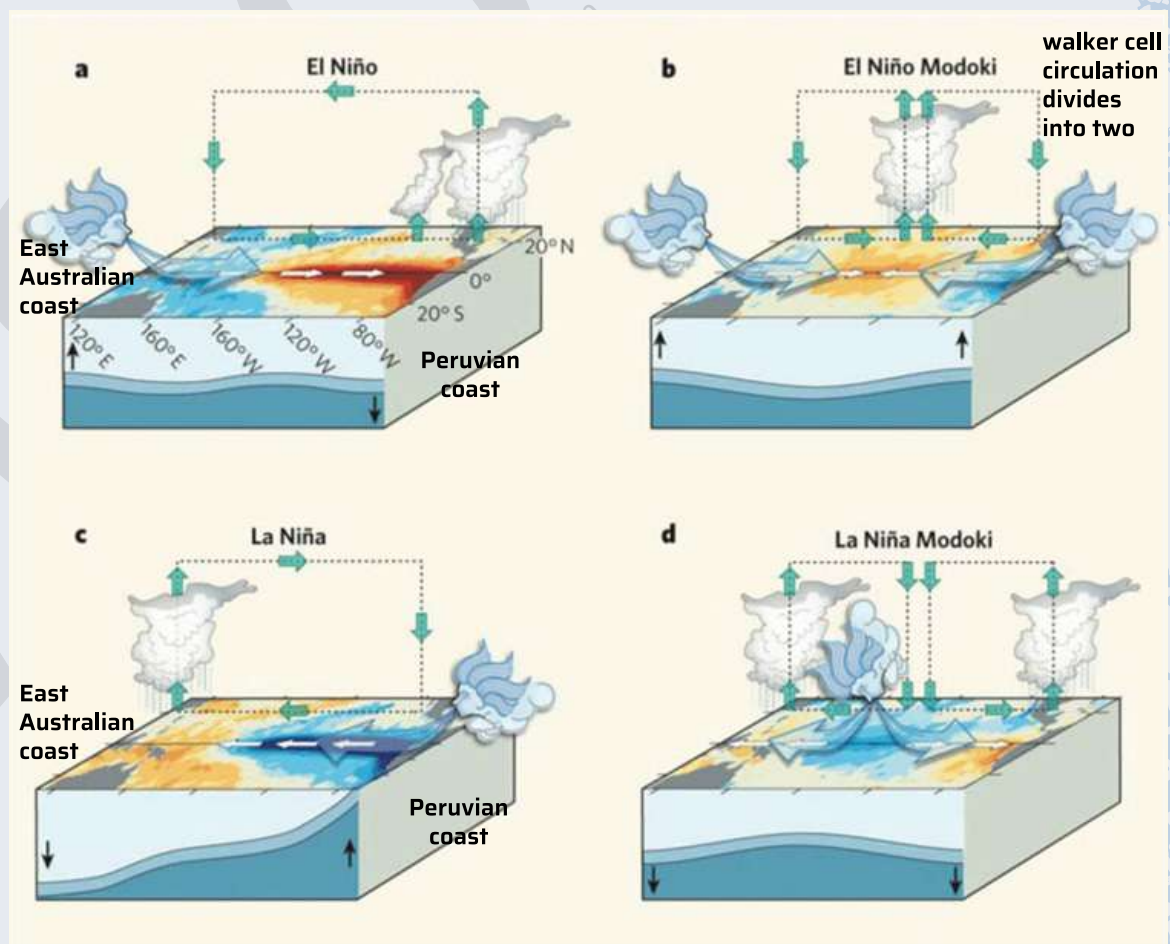
Southern Oscillation Index (SOI)

Positive SOI	Negative SOI
Tahiti pressure greater than that of Port Darwin	Reverse
Pressure high over eastern Pacific and low over	Reverse
Drought conditions in Eastern Pacific and good rainfall in Western Pacific (Northern Australia and Indonesia)	Reverse
Good for Indian Monsoons	Bad for Indian Monsoons



EL-NINO & LA-NINA MODOKI

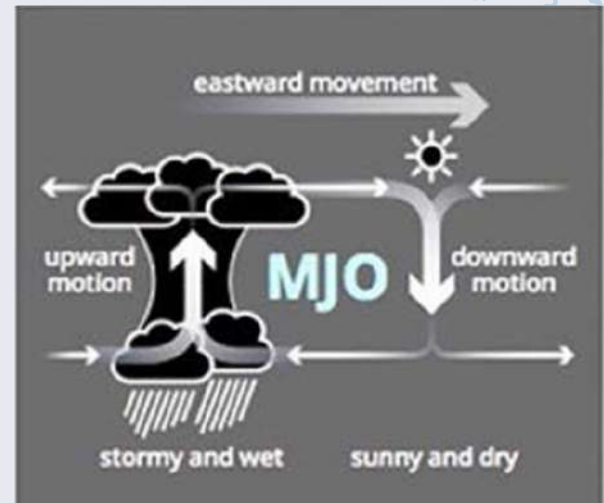
- El Nino Modoki is a coupled ocean-atmosphere phenomenon in the tropical Pacific.
- It is different from another coupled phenomenon in the tropical Pacific namely, El Nino.
- Conventional El Nino is characterized by strong anomalous warming in the eastern equatorial Pacific.
- Whereas, El Nino Modoki is associated with strong anomalous warming in the central tropical Pacific and cooling in the eastern and western tropical Pacific.
- La-Nina Modoki is the reverse conditions of El-Nino Modoki.



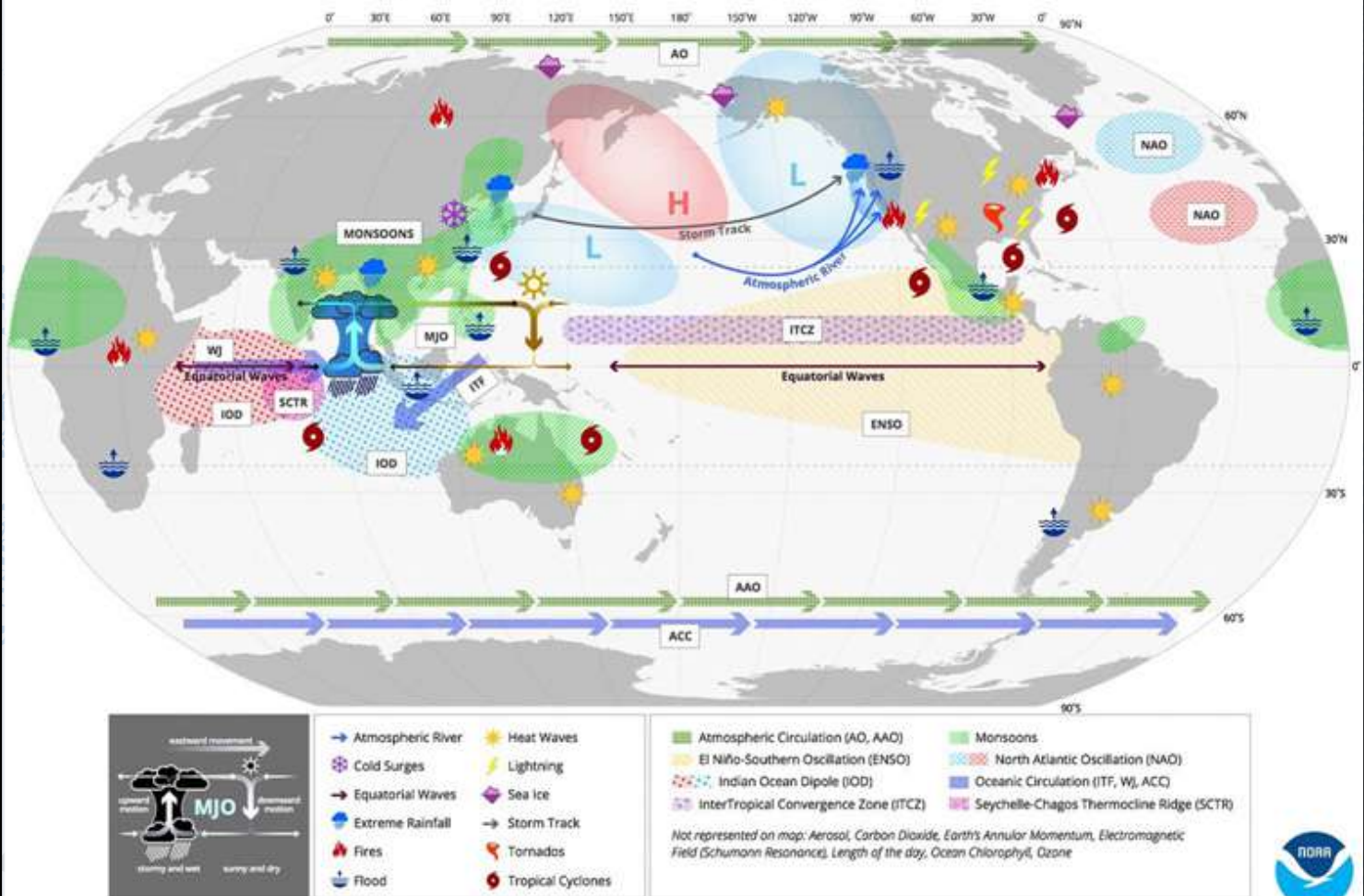


MADDEN JULIAN OSCILLATION

- The Madden-Julian Oscillation (MJO) is a tropical atmospheric phenomenon.
- It usually starts over the Indian Ocean, moves eastward across the Indo-Pacific Maritime Continent and into the Pacific Ocean over about a month, bringing heavy rainfall and stiff winds.
- As it moves eastward, it influences weather and climate phenomena in many parts of the world.



MADDEN-JULIAN OSCILLATION (MJO): GLOBAL IMPACTS





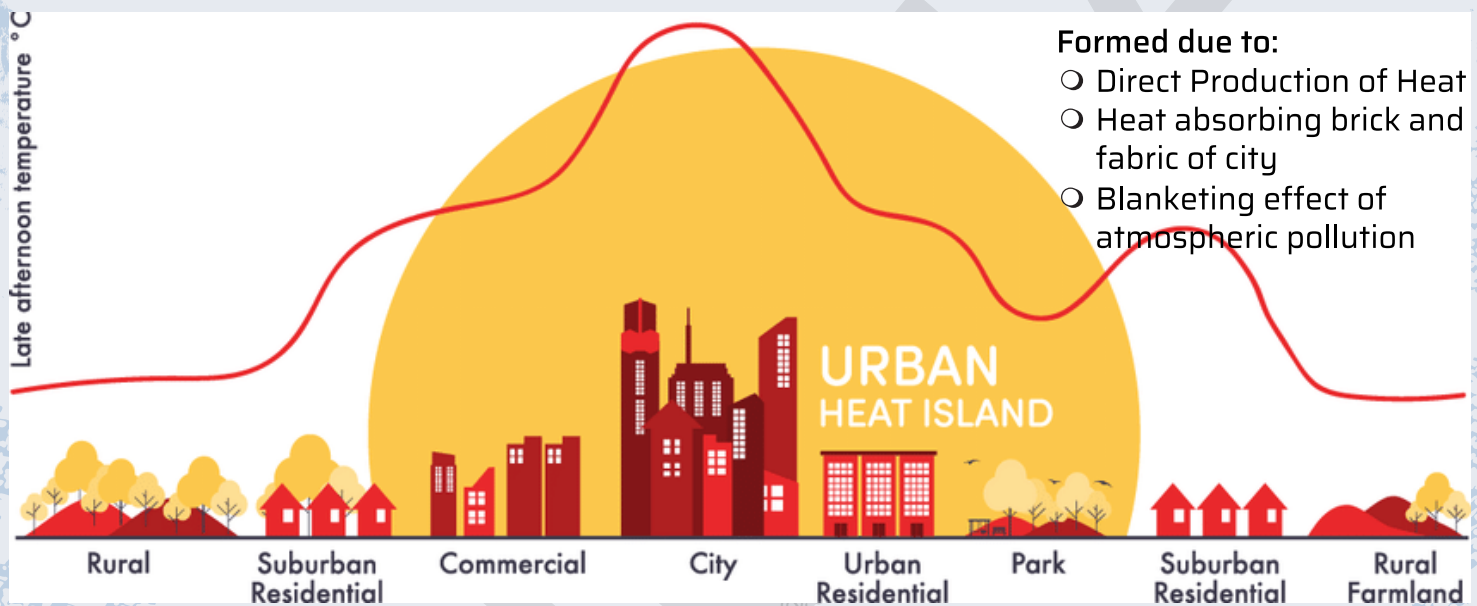
URBAN CLIMATE

Characteristics:

- Lower wind speed.
- Lower Humidity and Evaporation.
- Higher precipitation at times due to Thermal Turbulence.

URBAN HEAT ISLAND-

- A metropolitan area that is relatively warmer than its surrounding rural area due to human activities.
- The temperature difference is usually larger at night and can be as high as 10°C.



Impact of formation of Urban Heat Island

What are the risks from extreme heat?

Increased urban air temperatures from Urban Heat Island Effect means more:



City smog



Wildfires



Poor air quality



Respiratory illness



Heart-related illness

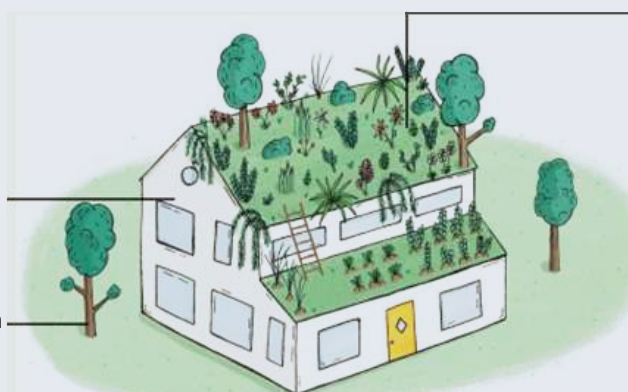


Hospital visit

Remedial Measures for Urban Heat Island

Light or reflective construction material

Well Watered vegetation



Green Roofs

Installation of resource efficient and environmentally sustainable Green Buildings.



Atmospheric Pollution Over Cities



MICROCLIMATE-It is the distinctive climate of small area

WHAT AFFECTS MICROCLIMATE?

CLOSE TO WATER

Areas close to water have cooling effects on land



DIRECTION OF WIND

Lakes can effect some major cooling and less pronounced cooling can occur when breezes transit rivers, streams, and large ponds



WIND TURBULENCE

Lakes can effect some major cooling and less pronounced cooling can occur when breezes transit rivers, streams, and large ponds

SOIL

What kind of soil your plant is growing in can have a big affect on microclimate. For instance, the pH balance, sandy, loamy, and clay.



URBAN DEVELOPMENTS

Large buildings, roads, and other urban features that retain heat and can increase temperatures



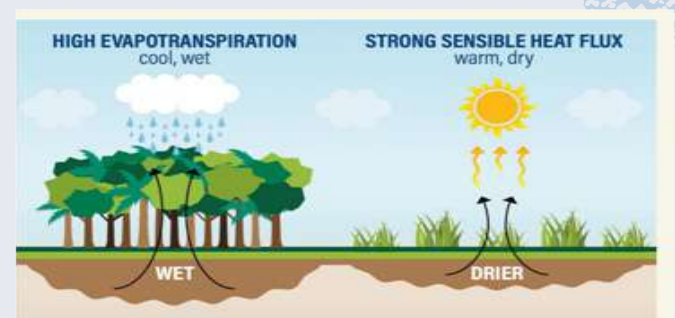
Coastal Area Microclimate

- Coastal climate is influenced by both land and water.
- Sea maintains a relatively constant day to day temperature in comparison to land.
- Sea provides a moderating effect to temperatures in coastal areas.
- Land & Sea breeze contributes towards this microclimate.



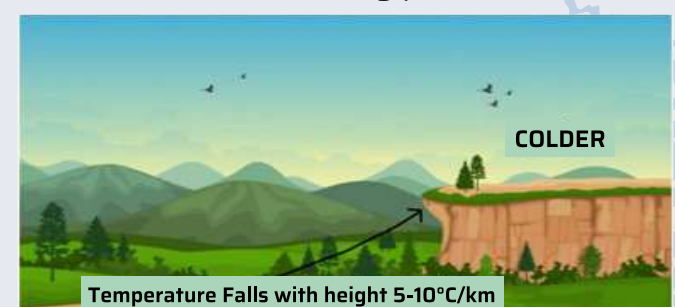
Forest Area Microclimate

- These areas are cooler and wetter than surrounding due to Evapotranspiration.



Upland Area Microclimate

- Due to height these areas are relatively cooler than surrounding plain area.



○ Urban Area Microclimate

- Temperature is higher than surrounding due to increased pollution levels.



APPLIED CLIMATOLOGY

It is the scientific analysis of climatic data in the light of useful applications for an operational purpose.

CLIMATE & VEGETATION	Natural vegetation-indicator of climate. Knowledge of climatic conditions essential to know about Forest growth, task for afforestation and watershed management.
CLIMATE & AGRICULTURE	Climate & weather components-Temperature, Precipitation, humidity, wind etc.-plays important role in crop production. Example-crops rice coffee, bananas and sugar cane are very sensitive to Frosts.
CLIMATE & ANIMAL HUSBANDRY	Pasture land & crops influenced by climatic factors. Temperature factor-most important-affecting animal husbandry. If temperature is very high, milk produced from animal is less.
CLIMATE & HOUSING	Climate determines House Type. Igloo-Polar Region, open houses-Tropical Areas.
MEDICAL CLIMATOLOGY	Studies relationship between Human Health and climate Local minds-like loo, cold waves causes depression, dizziness etc.